

Remarks/Arguments:

Claims 1-15 were the pending claims in this application. Claims 17 and 18 are new. Claim 17 is supported throughout the original specification at, for example, page 3, line 7. Claim 18 is supported throughout the original specification at, for example, page 3, lines 3 and 4. No new matter has been added. Claims 7-15 are withdrawn. Therefore, claim 1-15, 17, and 18 are the pending claims in this application.

Rejections under 35 U.S.C. § 103

Rejections of Claims 1-6

Claims 1-6 stand rejected under 35 U.S.C. § 103 as obvious over European Patent No. 0 812 818 (Ridland et al.). Applicants traverse this rejection and submit that the currently pending claims are patentable over the cited reference because (1) the Office has mischaracterized the claimed invention as a "base per acid equivalent"; (2) a *prima facie* case of obviousness has not been shown because Ridland et al. fails to teach or suggest a molar ratio of base to 2-hydroxy carboxylic acid in the range 0.01 – 0.6:1; and (3) even if a *prima facie* case of obviousness has been shown, it has been rebutted because Applicants have demonstrated ample evidence of unexpected and/or critical results in its Declaration of Richard Ward, Ph.D., pursuant to 37 C.F.R. §1.132 (attached hereto).

First, Applicants submit that the Office has mischaracterized the claimed invention as a "base per acid equivalent," which is not claimed. Claim 1 recites "the molar ratio of base to 2-hydroxy carboxylic acid is in the range 0.01 – 0.6:1." The Office states:

Although, Ridland does not teach that the ratio of base to 2-hydroxy acid is 0.01 – 0.6:1, Ridland does teach "Frequently the amount of base used is sufficient to fully neutralize the 2-hydroxy carboxylic acid but it is not essential that the acid be fully neutralized. Therefore, for monobasic 2-hydroxy acids such as lactic acid, the preferred amount of base is in the range of 0.8 to 1.2 mole per mole of 2-hydroxy acid," which shows using less than 1:1, further the reference teaches "in the case of citric acid (a tribasic acid), the preferred amount [of base] is in the range of 1 to 3 moles base per mole hydroxyl acid" (page 3, fourth full paragraph), [w]hich would suggest to the skilled artisan using 0.67-1:1 **base per acid equivalent**, however the amount of base used would have been determined through (sic) routine experimentation in the art, absent any evidence of unexpected result or criticality for the specifically claimed range. Office Action page 2 and 3 (emphasis added).

As is known to one of ordinary skill in the art, an acid equivalent is equal to one mole of H^+ or H_3O^+ ions, and a base equivalent is equal to one mole of OH^- ions. Thus, citric acid, a tribasic acid containing three acid groups, would require three "base equivalents" to be neutralized. Therefore, more base would be required, not less. Nonetheless, claim 1 recites a molar ratio of base to acid, not acid equivalents. Moreover, Applicants cannot ascertain how the Office arrived at the range of 0.67-1:1 base per acid equivalent or how that reads on the claimed invention. Accordingly, Applicants respectfully request withdrawal of the rejections.

Second, Applicants respectfully submit that a *prima facie* case of obviousness has not been shown because Ridland et al. fails to teach or suggest a molar ratio of base to 2-hydroxy carboxylic acid in the range 0.01 - 0.6:1. "To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations." M.P.E.P. §2143. In addition to the flaws noted above, the provision of Ridland et al. cited in the Office Action and quoted above merely contemplates that the acid need not be fully neutralized. Ridland et al. suggests an amount of base used to neutralize a monobasic acid could be as low as 0.8 moles per mole of base. Thus, the range of amounts of base as claimed do not touch or overlap with the range disclosed in Ridland et al. Moreover, 0.8 or greater is not even close to the range of 0.01 - 0.6:1 (at least 25% less than the lowest amount contemplated by Ridland et al.). Accordingly, a *prima facie* case of obviousness has not been shown.

Third, even if a *prima facie* case of obviousness has been shown, it has been rebutted because Applicants have demonstrated unexpected results in its Declarations of Richard Ward, Ph.D. and Calum Harry McIntosh. A *prima facie* case of obviousness may be rebutted by showing unexpected results. See M.P.E.P 2144.05(III).

Applicants have now provided *three* declarations describing the differences between Ridland et al., which is owned by the assignee of the present application, and the claimed invention and the unexpected properties found by reducing the molar ratio of base to acid to the claimed range. The Office has not found the first two declarations persuasive because "the results are not fully commensurate with the full scope of the claims" and "the declaration does not compare the closest prior art." Office Action page 5. In order to address the Office's concerns, *eight* data points have been compared showing catalysts according to the invention, in the claimed range of base to acid of 0.01 - 0.6:1, and outside the claimed range.

As explained in the Declaration of Richard Ward, Ph.D. and shown in the experiments described therein, the molar ratio of base to acid is critical and unexpected due to the wide thermal processing "window" between the glass transition temperature and the onset of crystallization when PET is made using the catalyst having a mole ratio of base : acid in the claimed range. Declaration paragraph 8. The higher onset of crystallization and crystallization temperature (T_n) of PET provides a benefit when the PET is melt processed and oriented or drawn because the orientation can take place between a wider range of temperatures before the PET structure sets on crystallization. Declaration paragraph 8. This raised crystallization temperature in the PET made using the catalyst with a base to acid ratio in the range of 0.01 - 0.6:1 is unexpected and commercially important. Declaration paragraph 9. The polyester resin must be processed at a temperature above the glass transition temperature (T_g) of the PET but below the crystallization temperature of the PET, because the oriented structure in the polymer is set when the polymer is crystallized. Declaration paragraph 9. With the slower crystallization exhibited by polyester made using the catalysts of the invention, the temperature "window" within which the PET processor can form and orient the polyester articles is significantly widened, which allows more processing to take place before the polymer crystallizes. Declaration paragraph 9. This is a significant benefit for a fabricator of polyester articles. Declaration paragraph 9. This effect and the commercial benefit imparted to polyester were wholly unexpected. Declaration paragraph 9.

Thus, five catalysts were prepared having mole ratios of base : acid of 0.2, 0.3, 0.4, 0.5, and 0.6, which are within the claimed range, and three catalysts were prepared having mole ratios of base : acid of 0.7, 0.8, and 1.2, which are outside of the claimed range. Applicants respectfully submit that this is ample evidence showing the unexpected results, which is commensurate in scope with the claims.

Additionally, while the Office alleges "the instant invention is not limited to 1,4-butane diol," Applicants note that a second unexpected advantage was found for 1,4-butane diol. In particular, as previously discussed, the composition includes 1,4-butanediol, base to acid ratios at 0.8 or higher formed an undesirable viscous gel, which was unsuitable for use as a catalyst. On the contrary, catalyst compositions including 1,4-butanediol and having a molar ratio of base to acid in the range of 0.01 - 0.6:1 surprisingly formed a hydrolytically stable, clear mobile liquid suitable for use as a catalyst, for example, in polyester-forming processes.

Accordingly, Applicants respectfully submit that a *prima facie* case of obviousness has not been shown. Moreover, even if a *prima facie* case of obviousness has been demonstrated, it has been rebutted because unexpected results were found at the lower base to acid ratio of 0.01 – 0.6:1, as claimed. It is respectfully submitted that independent claim 1 is in condition for allowance. Claims 2-6, 17, and 18 depend from claim 1 and therefore should each be allowed for at least the reasons set forth above.

New Claims 17 and 18

New claim 17 recites "the 2-hydroxy carboxylic acid is citric acid." In addition to the arguments presented above, Applicants note that Ridland et al. does not teach or suggest a molar ratio of base to citric acid in the range 0.01 – 0.6:1. Ridland et al. states "In the case of citric acid (a tribasic acid), the preferred amount [of base] is in the range of 1 to 3 moles base per mole of 2-hydroxy acid." Ridland et al. page 3, lines 26 and 27. As noted above, citric acid, a tribasic acid contains three acids groups, which would require three "base equivalents" to neutralize the citric acid. Therefore, if the base is a monoacidic base, such as sodium hydroxide, it would require three moles to neutralize the citric acid. Nonetheless, the lowest amount contemplated by Ridland et al. is one mole per mole of acid, e.g., for a triacidic base. Thus, it would not have been obvious, through routine experimentation or otherwise, to adjust the amount of base to a lesser value, because a skilled person would know that more base is required to neutralize the citric acid. For this reason as well, a *prima facie* case of obviousness has not been shown, and claim 17 should be in condition for allowance.

New claim 18 recites "the base is sodium hydroxide." Ridland et al. does not teach or suggest a molar ratio of sodium hydroxide to citric acid in the range 0.01 – 0.6:1. As discussed above, selection of a monoacidic base, would necessarily require more base to neutralize the tribasic citric acid. Accordingly, it would not have been obvious to lower the base to acid ratio to 0.01 – 0.6:1 based on the disclosure of Ridland et al. when the base is sodium hydroxide and the acid is citric acid. For this reason as well, a *prima facie* case of obviousness has not been shown, and claim 18 should be in condition for allowance.

Double Patenting

Claims 1-6 are provisionally rejected for nonstatutory obviousness-type double patenting as unpatentable over claims 1-12 of co-pending Application No. 10/432,510. Applicants respectfully submit that the claimed invention is patentably distinct over Application No.

10/432,510. Claim 1 recites a finite range of molar ratio of base to 2-hydroxycarboxylic acid of 0.01 – 0.6:1, which is not claimed in the co-pending application. Application No. 10/432,510 claims a significantly wider and higher ratio of base to acid in claim 8 of 2-12 base to 1.5-3.5 acid (or 0.57 – 8:1). Moreover, the unexpected results described in the Declaration provided herewith applies equally to the disclosure of Application No. 10/432,510. Accordingly, Applicants request withdrawal of the provisional obviousness-type double patenting rejection.

Conclusion

For all of the foregoing reasons, Applicants respectfully request reconsideration and allowance of the claims. Applicants invite the examiner to contact their undersigned representative if it appears that this may expedite examination.

Respectfully submitted,



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CRL/CEB/lrb

Attachment: Declaration of Richard Ward, Ph.D.

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The Director is hereby authorized to charge or credit Deposit Account No. 18-0350 for any additional fees, or any underpayment or credit for overpayment in connection herewith.

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